



BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

Richard A. Davey, MassDOT Secretary and CEO and MPO Chairman
Karl H. Quackenbush, Executive Director, MPO Staff

MEMORANDUM

DATE: December 19, 2013
TO: MassDOT Highway Division District 3
Town of Milford
FROM: Chen-Yuan Wang
Boston Region Metropolitan Planning Organization Staff
RE: Community Transportation Technical Assistance Program—Town of Milford

1 INTRODUCTION

The Community Transportation Technical Assistance Program (CTTAP) provides technical analysis and advice about local transportation issues to municipal officials. Staff members of the Boston Region Metropolitan Planning Organization (MPO) and the Metropolitan Area Planning Council (MAPC) assist with this program. As requested by the Town of Milford, the purpose of this study was to examine safety and operations at the intersection of Route 140 at South Main Street in Milford, and to explore potential improvements; specifically, to determine whether congestion at the intersection study could be relieved without major geometric modifications.

This intersection is under the jurisdiction of the Massachusetts Department of Transportation (MassDOT) Highway Division District 3. MPO staff met with MassDOT District 3 and Milford officials on May 16, 2013 to observe traffic conditions at the site and discuss issues and concerns. This memorandum contains a summary of existing conditions, list of issues and concerns, analysis of traffic and crash data, and recommended improvements.

Participating in the May 16 site visit were:

- Joseph R. Frawley, MassDOT District 3 Traffic Engineer
- Larry L. Dunkin, Milford Town Planner
- Vonnie M. Reis, Milford Town Engineer
- Chen-Yuan Wang, Boston Region MPO staff

2 EXISTING CONDITIONS

The intersection of Route 140 at South Main Street is located in a commercial area about a mile south of Milford Town Hall. It is a signalized intersection delineated by a somewhat irregular shape. Route 140—residing at Cape Road and South Main Street and running in the southeast-northwest direction—is the

major street of the intersection. Coming from the north, South Main Street intersects Route 140 at a skewed angle. Connected to the intersection from the southwest is a driveway of the adjacent CVS and Papa Gino's businesses.

As shown in Figure 1, Route 140 is a two-lane principal arterial. The northwest-bound approach to the intersection (South Main Street) is divided by a long triangular traffic island. The right lane continues as South Main Street and is controlled by a pair of yield signs, not within the control of the intersection's traffic signal. The regular-sized yield signs are not obvious from a distance at this wide approach. The left lane connects to Cape Road at the intersection and is widened to include a left-turn bay that accesses the adjacent CVS/Papa Gino's (Figure 2).

The Route 140 southeast-bound approach (Cape Road) also has a single lane. At the intersection, it widens to include a left-turn bay that accesses South Main Street northbound and a short channelized right-turn lane, which accesses CVS/Papa Gino's. South Main Street, also classified as a principal arterial, has one lane approaching the intersection from the north. It is mainly used as a through- and left-turn shared lane with a very short right-turn channelized turnoff. The CVS driveway contains two 10-foot lanes: one for through- and left-turn movements and the other for right turns only (Figure 3).

The traffic signal for the intersection operates in four phases: 1) a leading left-turn protected phase for Route 140 in both directions; 2) a concurrent phase for Route 140 in both directions with left turns permitted; 3) a split phase for the northbound lane (CVS driveway); and 4) a split phase for the southbound lane (South Main Street).

There are crosswalks across Cape Road and the CVS driveway but none across South Main Street. Pedestrian signals operate concurrently with traffic phases that do not conflict with the crossings when they are actuated. The crossing of the main section of Cape Road operates concurrently with the southbound traffic signal; and the crossing of the right-turn channelized turnoff to Cape Road is concurrent with the northbound traffic signal. No pedestrian signals are installed for crossing the CVS driveway.

Sidewalks exist on both sides of Cape Road and South Main Street north of the intersection, but they are discontinued on both sides of Route 140 (South Main Street) south of the intersection.

In addition to CVS and Papa Gino's, the intersection is surrounded by a number of businesses. North of the intersection, a restaurant is under construction to replace a former gasoline station. A few stores, including a popular sandwich shop, share a parking lot northeast of the intersection. South of the intersection, a major shopping center, Milford Square, is located on the east side of Route 140. Its driveway, controlled by a stop sign, is located on



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FIGURE 1
Existing Intersection Layout and Adjacent Developments
Route 140 at South Main Street, Milford

CTTAP
FFY 2013



FIGURE 2
South Main Street Northbound Approach



FIGURE 3
CVS Driveway at the Intersection of Route 140 and South Main Street

Route 140 about 200 feet south of this intersection. On the opposite side of the driveway is an entry-only driveway to a McDonald's restaurant on the west side of Route 140. A right-turn only exit from the CVS is also located just north of the McDonald's entrance. The exit's do-not-enter sign is facing Route 140 southeast bound instead of the driveway, which could be potentially confusing to drivers.

3 ISSUES AND CONCERNS

Milford town officials cited two major problems concerning this intersection: 1) traffic congestion during the morning and evening peak hours, especially in the evening and for the southbound approach of South Main Street; and 2) large number of crashes in the vicinity.

Below is a list of issues and concerns about this intersection:

- Traffic congestion at the intersection during peak hours, especially in the evening and for the southbound approach
- Large number of crashes and high crash rate
- Through traffic on the northbound approach of South Main Street not yielding to traffic from other approaches (potential for crashes)
- Lack of crosswalks for pedestrians on South Main Street
- Discontinued sidewalks south of the intersection
- Poor location of some of the many traffic control signs in the vicinity (potential for driver confusion)

4 CRASH DATA ANALYSIS

MPO staff collected two sets of the most recent available crash data: 1) MassDOT's Registry of Motor Vehicles (RMV) 2008–2010 crash data; and 2) crash reports provided by the Milford Police Department from 2008–2012. Table 1 summarizes the crash statistics at the intersection based on the available data. On average, approximately 12 crashes occurred at the intersection each year. About 20% of the total crashes resulted in personal injuries. Crash types consist of 47% rear-end collisions, 30% angle collisions, 7% sideswipe collisions, 5% single-vehicle collisions, and 8% unknown. No crashes involved pedestrians and one crash involved a bicycle. Slightly more than 20% of the total crashes occurred during peak periods, which is considered normal for signalized intersections.

TABLE 1
Intersection Crash Statistics
MassDOT Crash Data 2008–10 and Milford Police Crash Reports 2008–12

Statistics Period	2008	2009	2010	2011	2012	5-Year Total	Annual Average
Total Number of Crashes	12	21	20	7	4	64	12.8
<i>Crash Severity:</i>	--	--	--	--	--	--	--
Property Damage Only	8	16	13	5	3	45	9.0
Non-Fatal Injury	3	3	4	2	1	13	2.6
Fatality	0	0	0	0	0	0	0.0
Not Reported/Unknown	1	2	3	0	0	6	1.2
<i>Collision Type:</i>	--	--	--	--	--	--	--
Single Vehicle	1	3	0	0	1	5	1.0
Rear-End	6	8	10	3	1	28	5.6
Angle	3	7	6	1	1	18	3.6
Sideswipe, Same Direction	0	1	2	3	1	7	1.4
Sideswipe, Opposite Direction	0	0	0	0	0	0	0.0
Head-On	0	0	0	0	0	0	0.0
Rear-to-Rear	0	1	2	0	0	3	0.6
Not Reported/Unknown	0	1	0	0	0	1	0.2
Involved Pedestrian(s)	0	0	0	0	0	0	0.0
Involved Cyclist(s)	1	0	0	0	0	1	0.2
Occurred During Weekday Peak Periods*	4	3	3	1	2	13	2.6
Wet or Icy Pavement Conditions	1	3	7	2	0	13	2.6
Dark Conditions (Lit or Unlit)	2	6	5	1	0	14	2.8

* Peak periods are defined as 7:00–10:00 AM and 3:30–6:30 PM.

Crash rate¹ is an effective tool for examining the relative safety of a location. Based on the crash and traffic data collected for a recent study² for the Town of Milford, the crash rate for this intersection was calculated as 1.51 (see Appendix A). This is higher than the average crash rate for signalized locations

¹ Crash rates are estimated based on crash frequency (crashes per year) and vehicle exposure (traffic volumes or miles traveled). Crash rates are expressed as “crashes per million entering vehicles” for intersection locations and as “crashes per million miles traveled” for roadway segments.

² Phase I – Milford Veterans Memorial Drive Extension, Fay, Spofford & Thorndike, October 16, 2012.

in MassDOT Highway Division District 3, which is estimated to be 0.89.³ Note that the crashes geocoded at this intersection also include crashes at the driveways of Milford Square Shopping center and the adjacent businesses.

Based on the Milford Police Department crash reports, MPO staff constructed a collision diagram for the intersection (see Figure 4). The diagram shows a range of different types of collisions occurring at different locations, with no noticeable crash patterns. The most problematic location, the yield sign northbound on South Main Street, does not have a high number of crashes. In the five-year data shown in Table 1, three rear-end crashes (with no personal injuries) were related to an approaching vehicle failing to yield or stopping too late.

5 INTERSECTION CAPACITY ANALYSIS

The intersection capacity analysis, modeled as a fully actuated individual intersection, was based on turning-movement counts collected on June 7, 2012. The counts, including bicycle movements and pedestrian crossings, were collected in the morning (AM) peak period from 7:00 to 9:00 and in the evening (PM) peak period from 4:00 to 6:00. The data indicate that the intersection carried about 1,800 vehicles in the AM peak hour from 7:45 to 8:45, and about 2,100 vehicles in the PM peak hour from 5:00 to 6:00 (see Appendix B for detailed 15-minute breakdowns of both peak periods). There were about three-to-five pedestrians and about two-to-three bicycles crossing the intersection during each of the two-hour peak traffic periods. Heavy vehicles comprised about three percent of total traffic in the AM peak hour and about one percent in the PM peak hour.

Table 2 summarizes analysis results from Synchro⁴ for existing conditions in the AM and PM peak hours. Analysis indicates that the intersection operates at acceptable level of service (LOS) D in the AM peak hour with an average delay of about 45 seconds per vehicle. In the PM peak hour, the intersection is estimated to operate at an undesirable LOS F with an average delay of more than 80 seconds per vehicle. Most of the delay accrues on the left-turn and

³ The average crash rates estimated by the MassDOT Highway Division (as of January 23, 2013) are based upon a database that contains intersection crash rates submitted to MassDOT as part of the review process for an Environmental Impact Report or Functional Design Report.

⁴ Synchro Version 8 is developed and distributed by Trafficware Ltd. The software can perform capacity analysis and traffic simulation (when combined with SimTraffic) for an individual intersection or a series of intersections.

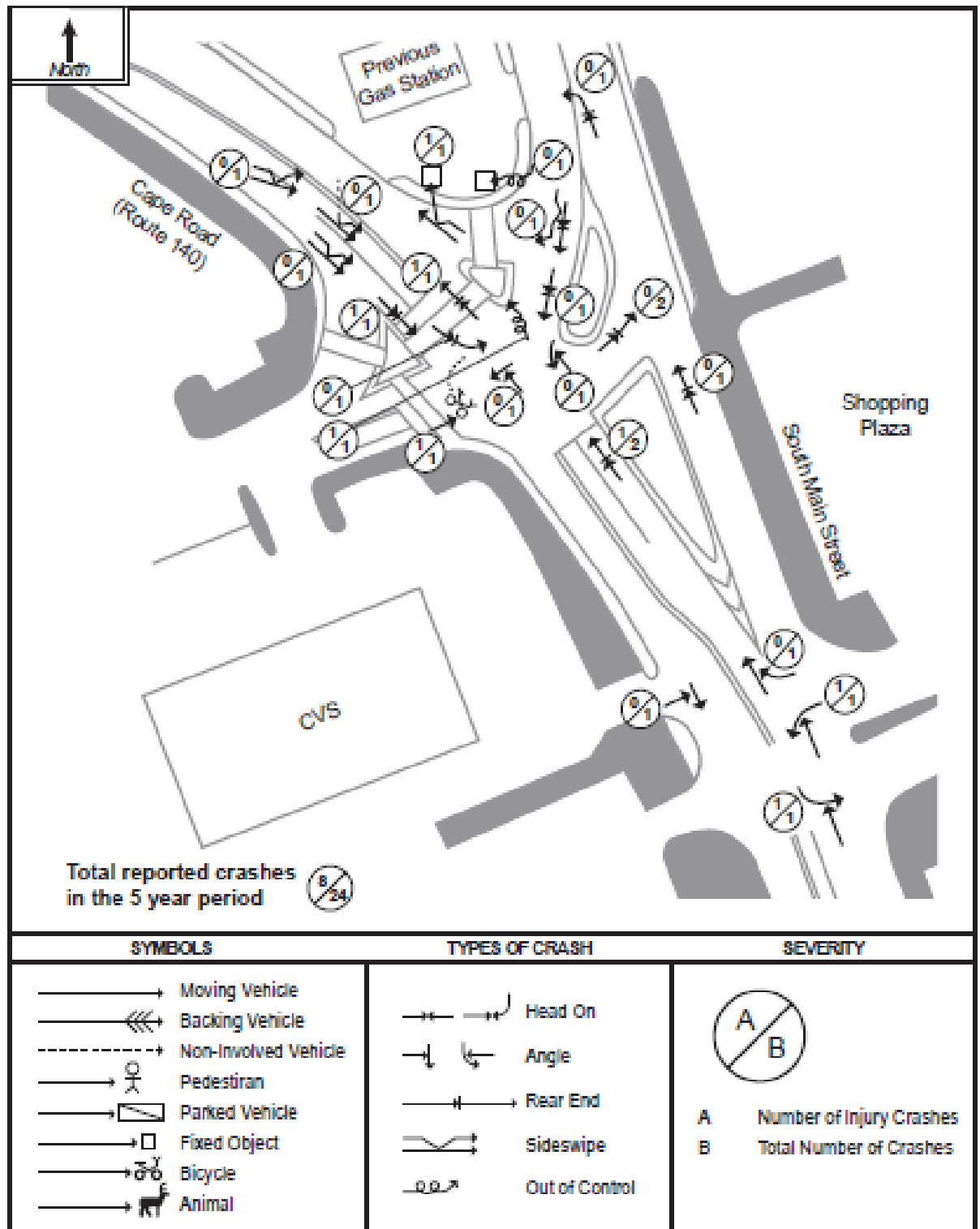


FIGURE 4
Intersection Collision Diagram
Milford Police Crash Reports 2008–12

through movements on the southbound (South Main Street) and northbound (the CVS driveway) approaches. (Detailed analysis parameters and results for the AM and PM peak hours are included in Appendix C.)

Using Synchro's signal optimization function, MPO staff tested a number of scenarios with no major modifications of the intersection layout and found that: 1) the signal-phasing sequence is appropriate for the existing layout; and 2) the intersection's operations could be improved by reassigning the two lanes of the CVS driveway to a left-turn exclusive lane and a through- and right-turn shared lane, and by slightly adjusting the signal timing. These modifications would slightly reduce the protected left-turn phase in both peak periods and slightly increase the southbound phase in the PM peak period.

Table 3 summarizes the proposed improvements in both the AM and PM peak hours. In the PM peak hour, the intersection's operations would improve from LOS F to LOS E, with an average reduction in delay of 20 seconds per vehicle. (Detailed signal-timing settings and analysis results for the proposed scenario in the both the AM and PM peak hours are shown in Appendix D.)

TABLE 2
Intersection Capacity Analysis, Existing Conditions

Street Name/Lane Group	Route 140 SE Bound /LT	Route 140 SE Bound/TH/RT	Route 140 NW Bound /LT	Route 140 NW Bound/TH/RT	S. Main St. SB/ LT/TH	S. Main St. SB/ RT	CVS Drive-way NB/ LT/TH	CVS Drive-way NB/RT	Inter-section Average
AM Peak Hour LOS	C	D	B	D	E	A	F	A	D
AM Peak Hour Delay (sec/veh)	24	43	19	46	56	4	136	1	45
PM Peak Hour LOS	C	D	B	E	F	A	F	A	F
PM Peak Hour Delay (sec/veh)	23	52	20	58	147	8	>180	1	81

TABLE 3
Intersection Capacity Analysis, Proposed Improvements

Street Name/Lane Group	Route 140 SE Bound /LT	Route 140 SE Bound/TH/RT	Route 140 NW Bound /LT	Route 140 NW Bound/TH/RT	S. Main St. SB/ LT/TH	S. Main St. SB/ RT	CVS Drive-way NB/ LT/TH	CVS Drive-way NB/RT	Inter-section Average
AM Peak Hour LOS	C	D	B	C	D	A	D	C	D
AM Peak Hour Delay (sec/veh)	24	41	19	35	456	4	44	28	37
PM Peak Hour LOS	C	E	C	E	F	A	E	C	E
PM Peak Hour Delay (sec/veh)	31	58	23	58	86	8	56	31	60

6 IMPROVEMENT RECOMMENDATIONS

The study intersection is located in a commercial area that is congested during the PM peak hour and records a high number of crashes. The crash data analysis does not indicate any distinct collision types or crash patterns; and the yield-sign-controlled South Main Street northbound approach does not have an extremely high number of crashes. The crashes geocoded at the intersection include those occurring at the adjacent commercial driveways. The Town recently improved the controls at some of the driveways, especially at CVS and McDonalds. So, it appears that the number of crashes actually may be lessening. However, crash data should be examined continuously, especially when the 2011–2012 MassDOT RMV crash data are available.

The purpose of this study was to examine whether congestion at the intersection study could be relieved without major geometric modifications. Intersection capacity analysis indicates that the signal sequence and timing are appropriate under the existing layout; and there is limited room for signal optimization. One tested scenario may potentially improve congestion at the intersection. It consists of two components: 1) reassigning the two lanes of the CVS driveway into a left-turn exclusive lane and a through- and right-turn shared lane; and 2) adjusting the signal timing by a) slightly reducing the protected left-turn phase in both peak periods and b) slightly increasing the southbound phase in the PM peak period (see Appendix D).

The through movement from the CVS driveway aligns better on the right than on the left lane to South Main Street northbound (see Figure 2). The proposed lane reassignment would require pavement restriping and a few changes:

- Restripe the right lane with a through/right-turn arrow and the left lane with a left-turn-only arrow
- Change the two existing right-lane-must-turn-right signs to read “left lane must turn left”
- Mark “to South Main Street” on the right-lane pavement and “to Cape Road” on the left-lane pavement⁵

Additional short-term improvement recommendations in the intersection vicinity are:

- Increase the size of the two South Main Street northbound yield signs (see Figure 1) to 48”x48”x48”

⁵ This is an optional measure as the driveway length is limited. Some drivers may confuse the through movement to South Main Street northbound as a left turn. It would help to reduce confusion and potentially reduce some sideswipe collisions.

- Relocate the “left lane must turn left” sign currently placed to the south of the CVS exit-only driveway to about 20 feet north of the exit⁶
- Remove the do-not-enter sign on the same post of the left-lane-must-turn-left sign and place a do-not-enter sign on back of each sign (one stop sign and one no-left-turn arrow sign) currently posted at the CVS exit⁷

The study intersection’s pedestrian and bicycle facilities are insufficient. A number of long-term improvements should be considered when there are opportunities to reconstruct Route 140 and the intersection layout:

- Install a five-foot sidewalk on the north side of Route 140⁸
- Install a crosswalk across South Main Street at the intersection⁹
- Provide four-foot shoulders (at a minimum) for bicycles on both sides of Route 140
- Modify the two small triangular traffic islands on the Route 140 southeast-bound approach in order to slow traffic and shorten the pedestrian crossing distance¹⁰

CW/cw

⁶ The sign is intended for left turns to Milford Square Shopping Center. The current location is almost past the Center’s driveway, too late for drivers to see it.

⁷ The do-not-enter sign is currently facing Route 140 southeast bound instead of the entrance of the driveway, which could potentially confuse drivers as to the entrance for McDonald’s. Placing them at the entrance of the CVS exit would not only reduce confusion for right turners but also would make the signs visible to the left turns from Route 140 southbound (avoiding confusion about the McDonald’s entrance).

⁸ Preferably the sidewalk should continue from this intersection, passing Milford Square Shopping Center, to further south at the Big Lots Shopping Center. It would serve almost all the businesses in the area.

⁹ The crosswalk could be located across the Route 140 northwest-bound approach and the South Main Street northbound approach. The installation should include pedestrian signal heads and a traffic signal head to control the traffic on the South Main Street northbound. Also, the intersection signal sequence and timing needs to be rearranged accordingly.

¹⁰ The right-turn lane appears to be wide (20 feet or more) and the islands can be expanded somewhat, especially the one at the CVS driveway. Currently there is a do-not-enter sign facing the driveway at the turnoff (see Figure 2). A narrower opening with an appropriate division island design and pavement striping would reduce confusion.

APPENDIX A

Intersection Crash Rate Calculation

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Milford COUNT DATE : 6/7/2012

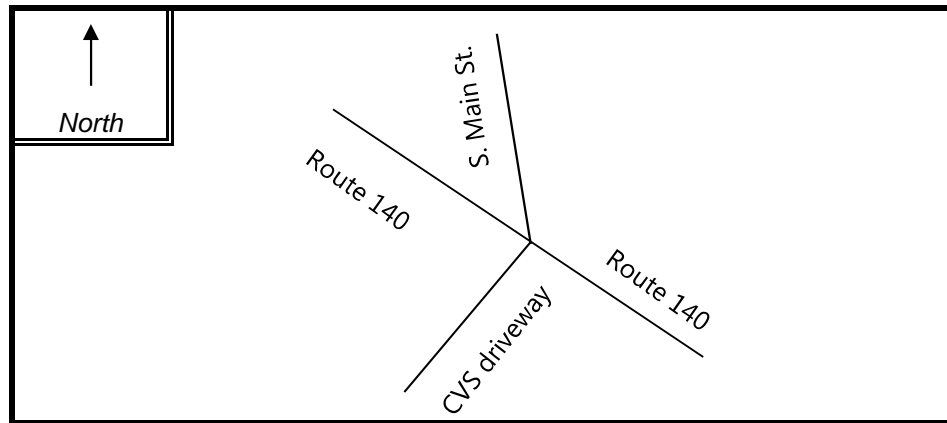
DISTRICT : 3 UNSIGNALIZED : ☐ SIGNALIZED : ☒

~ INTERSECTION DATA ~

MAJOR STREET : Route 140

MINOR STREET(S) : S. Main Street/CVS Driveway

**INTERSECTION
DIAGRAM**



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB	WB		
PEAK HOURLY VOLUMES (AM/PM) :	114	624	518	829		2,085

" K " FACTOR :

0.090

INTERSECTION ADT (V) = TOTAL DAILY APPROACH VOLUME :

23,167

TOTAL # OF CRASHES :

64

OF YEARS :

5

AVERAGE # OF CRASHES PER YEAR (A) :

12.80

CRASH RATE CALCULATION :

1.514

$$\text{RATE} = \frac{(A * 1,000,000)}{(V * 365)}$$

Comments : MassDOT District 3 Average Rate = 0.89 (updated January 23, 2013)

Project Title & Date: Community Transportation Technical Assistance Program: Milford

APPENDIX B

Intersection Turning Movement Counts

June 7, 2012

Accurate Counts

978-664-2565

N/S Street : South Main Street
 E/W Street: Cape Road / Plaza Drive
 City/State : Milford, MA
 Weather : Cloudy

File Name : 07300001
 Site Code : 07300001
 Start Date : 6/7/2012
 Page No : 1

Groups Printed- Cars - Trucks

	So Main St From North			So Main St From South			Plaza Dr From West			Cape Rd From Northwest			
Start Time	Thru	Right	HdRt	Left	BrLt	Thru	HdLt	Left	Right	HdLt	BrRt	HdRt	Int. Total
07:00 AM	59	1	6	3	72	82	1	1	0	21	93	1	340
07:15 AM	63	1	8	4	85	97	1	1	2	24	91	3	380
07:30 AM	51	1	10	7	79	98	4	3	1	35	112	3	404
07:45 AM	81	4	10	12	82	125	3	7	7	45	101	2	479
Total	254	7	34	26	318	402	9	12	10	125	397	9	1603
08:00 AM	77	5	14	5	80	107	5	4	4	32	118	4	455
08:15 AM	63	6	9	8	102	87	2	4	8	26	115	8	438
08:30 AM	95	6	15	9	69	93	6	7	6	21	92	3	422
08:45 AM	108	9	5	4	104	92	4	0	2	7	111	2	448
Total	343	26	43	26	355	379	17	15	20	86	436	17	1763
Grand Total	597	33	77	52	673	781	26	27	30	211	833	26	3366
Apprch %	84.4	4.7	10.9	3.5	44.7	51.9	31.3	32.5	36.1	19.7	77.9	2.4	
Total %	17.7	1	2.3	1.5	20	23.2	0.8	0.8	0.9	6.3	24.7	0.8	
Cars	579	32	72	51	653	756	25	25	26	204	803	25	3251
% Cars	97	97	93.5	98.1	97	96.8	96.2	92.6	86.7	96.7	96.4	96.2	96.6
Trucks	18	1	5	1	20	25	1	2	4	7	30	1	115
% Trucks	3	3	6.5	1.9	3	3.2	3.8	7.4	13.3	3.3	3.6	3.8	3.4

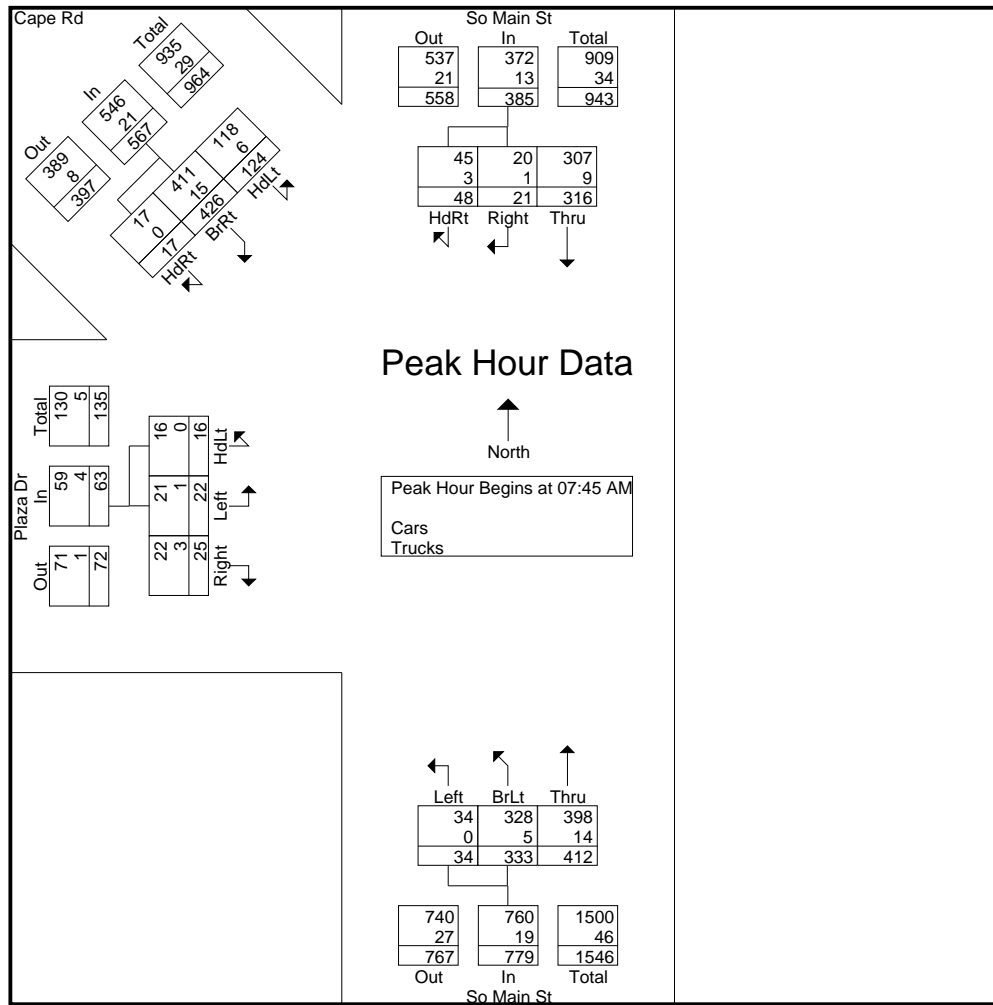
	So Main St From North				So Main St From South				Plaza Dr From West				Cape Rd From Northwest				
Start Time	Thru	Right	HdRt	App. Total	Left	BrLt	Thru	App. Total	HdLt	Left	Right	App. Total	HdLt	BrRt	HdRt	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	81	4	10	95	12	82	125	219	3	7	7	17	45	101	2	148	479
08:00 AM	77	5	14	96	5	80	107	192	5	4	4	13	32	118	4	154	455
08:15 AM	63	6	9	78	8	102	87	197	2	4	8	14	26	115	8	149	438
08:30 AM	95	6	15	116	9	69	93	171	6	7	6	19	21	92	3	116	422
Total Volume	316	21	48	385	34	333	412	779	16	22	25	63	124	426	17	567	1794
% App. Total	82.1	5.5	12.5		4.4	42.7	52.9		25.4	34.9	39.7		21.9	75.1	3		
PHF	.832	.875	.800	.830	.708	.816	.824	.889	.667	.786	.781	.829	.689	.903	.531	.920	.936
Cars	307	20	45	372	34	328	398	760	16	21	22	59	118	411	17	546	1737
% Cars	97.2	95.2	93.8	96.6	100	98.5	96.6	97.6	100	95.5	88.0	93.7	95.2	96.5	100	96.3	96.8
Trucks	9	1	3	13	0	5	14	19	0	1	3	4	6	15	0	21	57
% Trucks	2.8	4.8	6.3	3.4	0	1.5	3.4	2.4	0	4.5	12.0	6.3	4.8	3.5	0	3.7	3.2

Accurate Counts

978-664-2565

N/S Street : South Main Street
 E/W Street: Cape Road / Plaza Drive
 City/State : Milford, MA
 Weather : Cloudy

File Name : 07300001
 Site Code : 07300001
 Start Date : 6/7/2012
 Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
 Peak Hour for Each Approach Begins at:

	08:00 AM				07:30 AM				07:45 AM				07:30 AM			
+0 mins.	77	5	14	96	7	79	98	184	3	7	7	17	35	112	3	150
+15 mins.	63	6	9	78	12	82	125	219	5	4	4	13	45	101	2	148
+30 mins.	95	6	15	116	5	80	107	192	2	4	8	14	32	118	4	154
+45 mins.	108	9	5	122	8	102	87	197	6	7	6	19	26	115	8	149
Total Volume	343	26	43	412	32	343	417	792	16	22	25	63	138	446	17	601
% App. Total	83.3	6.3	10.4		4	43.3	52.7		25.4	34.9	39.7		23	74.2	2.8	
PHF	.794	.722	.717	.844	.667	.841	.834	.904	.667	.786	.781	.829	.767	.945	.531	.976
Cars	330	25	41	396	32	334	402	768	16	21	22	59	133	429	17	579
% Cars	96.2	96.2	95.3	96.1	100	97.4	96.4	97	100	95.5	88	93.7	96.4	96.2	100	96.3
Trucks	13	1	2	16	0	9	15	24	0	1	3	4	5	17	0	22
% Trucks	3.8	3.8	4.7	3.9	0	2.6	3.6	3	0	4.5	12	6.3	3.6	3.8	0	3.7

Accurate Counts
978-664-2565

N/S Street : South Main Street
E/W Street: Cape Road / Plaza Drive
City/State : Milford, MA
Weather : Cloudy

File Name : 07300001
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Start Date : 6/7/2012
Page No : 1

Groups Printed- Bikes Peds

	So Main St From North				So Main St From South				Plaza Dr From West				Cape Rd From Northwest						
Start Time	Thru	Right	HdRt	Peds	Left	BrLt	Thru	Peds	HdLt	Left	Right	Peds	HdLt	BrRt	HdRt	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2	0	2
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	3	0	3
08:00 AM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	2
08:15 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	2	1	3
Grand Total	0	0	0	1	0	0	1	1	0	0	0	1	0	0	0	2	5	1	6
Apprch %	0	0	0		0	0	100		0	0	0		0	0	0				
Total %	0	0	0		0	0	100		0	0	0		0	0	0		83.3	16.7	

[illegible]

Accurate Counts

978-664-2565

N/S Street : South Main Street
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 Start Date : 6/7/2012
 Page No : 1

Groups Printed- Cars - Trucks

	So Main St From North			So Main St From South			Plaza Dr From West			Cape Rd From Northwest			
Start Time	Thru	Right	HdRt	Left	BrLt	Thru	HdLt	Left	Right	HdLt	BrRt	HdRt	Int. Total
04:00 PM	121	6	20	7	114	79	5	8	7	19	96	1	483
04:15 PM	115	5	26	14	90	87	10	13	4	19	117	3	503
04:30 PM	106	10	24	5	104	91	4	8	5	18	120	4	499
04:45 PM	123	5	29	10	97	77	5	17	12	15	95	6	491
Total	465	26	99	36	405	334	24	46	28	71	428	14	1976
05:00 PM	116	8	27	17	116	94	7	8	10	21	133	9	566
05:15 PM	124	13	19	7	104	93	6	9	13	23	116	2	529
05:30 PM	120	17	33	10	105	103	12	7	8	22	81	3	521
05:45 PM	97	9	30	9	122	67	7	9	8	11	118	5	492
Total	457	47	109	43	447	357	32	33	39	77	448	19	2108
Grand Total	922	73	208	79	852	691	56	79	67	148	876	33	4084
Apprch %	76.6	6.1	17.3	4.9	52.5	42.6	27.7	39.1	33.2	14	82.9	3.1	
Total %	22.6	1.8	5.1	1.9	20.9	16.9	1.4	1.9	1.6	3.6	21.4	0.8	
Cars	902	71	207	79	851	685	55	79	66	147	864	33	4039
% Cars	97.8	97.3	99.5	100	99.9	99.1	98.2	100	98.5	99.3	98.6	100	98.9
Trucks	20	2	1	0	1	6	1	0	1	1	12	0	45
% Trucks	2.2	2.7	0.5	0	0.1	0.9	1.8	0	1.5	0.7	1.4	0	1.1

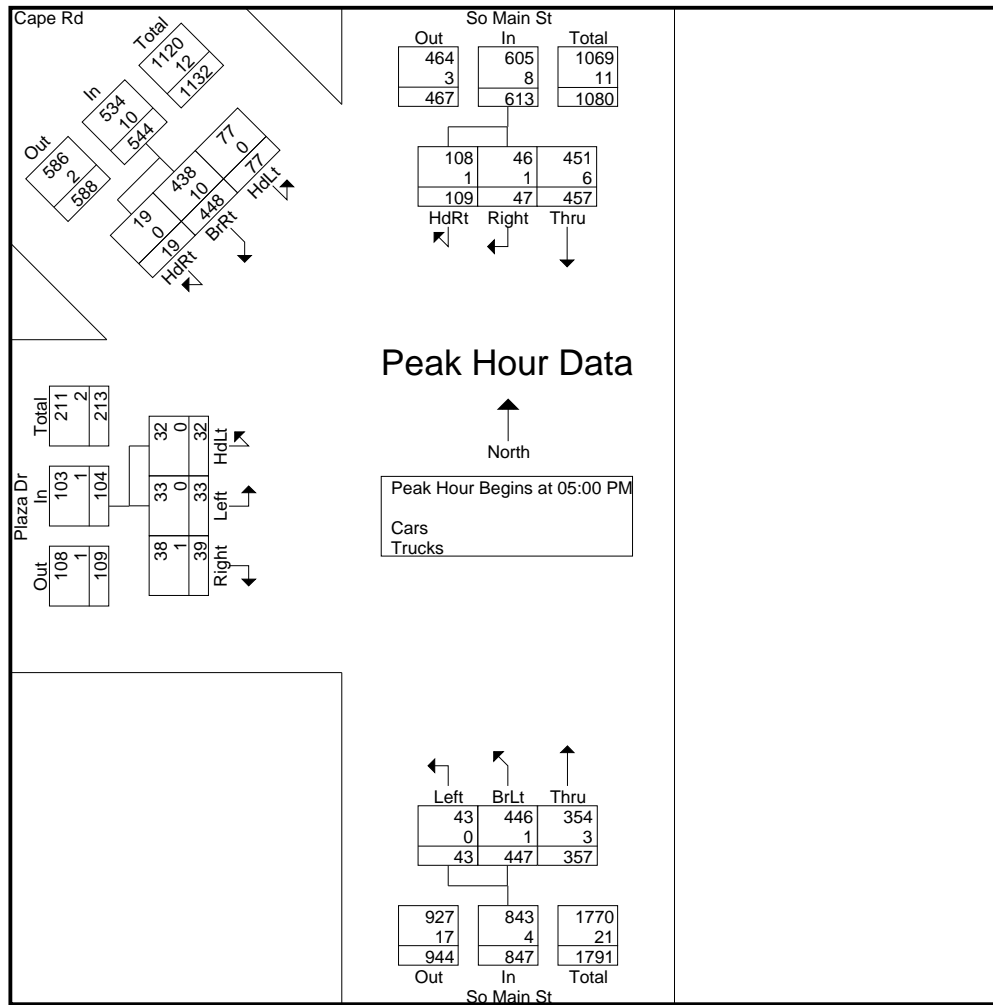
	So Main St From North				So Main St From South				Plaza Dr From West				Cape Rd From Northwest				
Start Time	Thru	Right	HdRt	App. Total	Left	BrLt	Thru	App. Total	HdLt	Left	Right	App. Total	HdLt	BrRt	HdRt	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	116	8	27	151	17	116	94	227	7	8	10	25	21	133	9	163	566
05:15 PM	124	13	19	156	7	104	93	204	6	9	13	28	23	116	2	141	529
05:30 PM	120	17	33	170	10	105	103	218	12	7	8	27	22	81	3	106	521
05:45 PM	97	9	30	136	9	122	67	198	7	9	8	24	11	118	5	134	492
Total Volume	457	47	109	613	43	447	357	847	32	33	39	104	77	448	19	544	2108
% App. Total	74.6	7.7	17.8		5.1	52.8	42.1		30.8	31.7	37.5		14.2	82.4	3.5		
PHF	.921	.691	.826	.901	.632	.916	.867	.933	.667	.917	.750	.929	.837	.842	.528	.834	.931
Cars	451	46	108	605	43	446	354	843	32	33	38	103	77	438	19	534	2085
% Cars	98.7	97.9	99.1	98.7	100	99.8	99.2	99.5	100	100	97.4	99.0	100	97.8	100	98.2	98.9
Trucks	6	1	1	8	0	1	3	4	0	0	1	1	0	10	0	10	23
% Trucks	1.3	2.1	0.9	1.3	0	0.2	0.8	0.5	0	0	2.6	1.0	0	2.2	0	1.8	1.1

Accurate Counts

978-664-2565

N/S Street : South Main Street
E/W Street: Cape Road / Plaza Drive
City/State : Milford, MA
Weather : Cloudy

File Name : 07300001
Site Code : 07300001
Start Date : 6/7/2012
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:45 PM				05:00 PM				04:45 PM				04:30 PM			
+0 mins.	123	5	29	157	17	116	94	227	5	17	12	34	18	120	4	142
+15 mins.	116	8	27	151	7	104	93	204	7	8	10	25	15	95	6	116
+30 mins.	124	13	19	156	10	105	103	218	6	9	13	28	21	133	9	163
+45 mins.	120	17	33	170	9	122	67	198	12	7	8	27	23	116	2	141
Total Volume	483	43	108	634	43	447	357	847	30	41	43	114	77	464	21	562
% App. Total	76.2	6.8	17		5.1	52.8	42.1		26.3	36	37.7		13.7	82.6	3.7	
PHF	.974	.632	.818	.932	.632	.916	.867	.933	.625	.603	.827	.838	.837	.872	.583	.862
Cars	475	42	107	624	43	446	354	843	30	41	43	114	76	459	21	556
% Cars	98.3	97.7	99.1	98.4	100	99.8	99.2	99.5	100	100	100	100	98.7	98.9	100	98.9
Trucks	8	1	1	10	0	1	3	4	0	0	0	0	1	5	0	6
% Trucks	1.7	2.3	0.9	1.6	0	0.2	0.8	0.5	0	0	0	0	1.3	1.1	0	1.1

Accurate Counts

978-664-2565

N/S Street : South Main Street
 E/W Street: Cape Road / Plaza Drive
 City/State : Milford, MA
 Weather : Cloudy

File Name : 07300001
 Site Code : 07300001
 Start Date : 6/7/2012
 Page No : 1

Groups Printed- Bikes Peds

	So Main St From North				So Main St From South				Plaza Dr From West				Cape Rd From Northwest				Exclu. Total	Inclu. Total	Int. Total
Start Time	Thru	Right	HdRt	Peds	Left	BrLt	Thru	Peds	HdLt	Left	Right	Peds	HdLt	BrRt	HdRt	Peds			
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
04:45 PM	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	1	2	3
Total	0	0	0	2	0	0	0	0	0	1	1	0	0	0	0	0	2	2	4
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Total	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Grand Total	1	0	0	2	0	0	0	0	0	1	1	0	0	0	0	0	2	3	5
Apprch %	100	0	0		0	0	0		0	50	50		0	0	0				
Total %	33.3	0	0		0	0	0		0	33.3	33.3		0	0	0		40	60	

	So Main St From North				So Main St From South				Plaza Dr From West				Cape Rd From Northwest				
Start Time	Thru	Right	HdRt	App. Total	Left	BrLt	Thru	App. Total	HdLt	Left	Right	App. Total	HdLt	BrRt	HdRt	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	2
Total Volume	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	2
% App. Total	0	0	0		0	0	0		0	50	50		0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.250	.250	.000	.000	.000	.000	.250





















APPENDIX C

AM/PM Peak-Hour Intersection Capacity Analysis Existing Conditions

Intersection Capacity Analysis

Route 140 at S. Main St., Milford

8/5/2013

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	16	22	25	316	21	48	124	426	17	34	333	0
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.92	0.92	0.92	0.89	0.89	0.89
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	6%	6%	6%	3%	3%	3%	4%	4%	4%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	46	30	0	406	58	135	481	0	38	374	0
Turn Type	Perm	NA	Perm	Perm	NA	pm+ov	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8	1	1	6		5	2	
Permitted Phases	4		4	8		8	6			2	2	
Detector Phase	4	4	4	8	8	1	1	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	10.0		6.0	10.0	
Minimum Split (s)	10.0	10.0	10.0	11.0	11.0	10.0	10.0	15.0		10.0	15.0	
Total Split (s)	14.0	14.0	14.0	40.0	40.0	14.0	14.0	35.0		14.0	35.0	
Total Split (%)	13.6%	13.6%	13.6%	38.8%	38.8%	13.6%	13.6%	34.0%		13.6%	34.0%	
Yellow Time (s)	3.0	3.0	3.0	4.0	4.0	3.0	3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0	4.0		5.0	4.0	4.0	5.0		4.0	5.0	
Lead/Lag						Lead	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?						Yes	Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	Min		None	Min	
Act Effect Green (s)		10.2	10.2		32.2	46.5	37.1	30.5		31.7	23.7	
Actuated g/C Ratio		0.11	0.11		0.34	0.50	0.40	0.33		0.34	0.25	
v/c Ratio		0.87	0.11		0.91	0.07	0.46	0.81		0.16	0.79	
Control Delay		136.2	0.8		56.3	3.5	23.5	42.9		18.8	46.3	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		136.2	0.8		56.3	3.5	23.5	42.9		18.8	46.3	
LOS		F	A		E	A	C	D		B	D	
Approach Delay		82.8			49.7			38.7			43.7	
Approach LOS		F			D			D			D	
Queue Length 50th (ft)		29	0		241	0	53	289		14	218	
Queue Length 95th (ft)		#95	0		#384	16	92	#477		33	318	
Internal Link Dist (ft)		20			492			2811			150	
Turn Bay Length (ft)						50						
Base Capacity (vph)		53	269		495	827	306	617		305	607	
Starvation Cap Reductn		0	0		0	0	0	0		0	0	
Spillback Cap Reductn		0	0		0	0	0	0		0	0	
Storage Cap Reductn		0	0		0	0	0	0		0	0	
Reduced v/c Ratio		0.87	0.11		0.82	0.07	0.44	0.78		0.12	0.62	
Intersection Summary												
Cycle Length: 103												

Intersection Capacity Analysis

Route 140 at S. Main St., Milford

8/5/2013

Actuated Cycle Length: 93.5

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 45.4

Intersection LOS: D

Intersection Capacity Utilization 65.4%







ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.





















Splits and Phases: 10: CVS Driveway/South Main Street & Cape Road (Route 140)

 ø1	 ø2	 ø4	 ø8
14 s	35 s	14 s	40 s
 ø5	 ø6		
14 s	35 s		

Intersection Capacity Analysis

Route 140 at S. Main St., Milford

8/5/2013

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	32	33	39	457	47	109	77	448	19	43	447	0
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.93	0.93	0.93	0.90	0.90	0.90	0.83	0.83	0.83	0.93	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	2%	2%	2%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	69	42	0	560	121	93	563	0	46	481	0
Turn Type	Perm	NA	Perm	Perm	NA	pm+ov	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8	1	1	6		5	2	
Permitted Phases	4		4	8		8	6			2	2	
Detector Phase	4	4	4	8	8	1	1	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	10.0		6.0	10.0	
Minimum Split (s)	10.0	10.0	10.0	11.0	11.0	10.0	10.0	15.0		10.0	15.0	
Total Split (s)	14.0	14.0	14.0	40.0	40.0	14.0	14.0	35.0		14.0	35.0	
Total Split (%)	13.6%	13.6%	13.6%	38.8%	38.8%	13.6%	13.6%	34.0%		13.6%	34.0%	
Yellow Time (s)	3.0	3.0	3.0	4.0	4.0	3.0	3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0	4.0		5.0	4.0	4.0	5.0		4.0	5.0	
Lead/Lag						Lead	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?						Yes	Yes				Yes	
Recall Mode	None	None	None	None	None	None	None	Min		None	Min	
Act Effect Green (s)		10.0	10.0		35.1	48.5	40.0	33.5		36.1	28.0	
Actuated g/C Ratio		0.10	0.10		0.35	0.49	0.40	0.34		0.36	0.28	
v/c Ratio		1.23	0.16		1.21	0.15	0.42	0.90		0.23	0.91	
Control Delay		237.1	1.3		146.8	8.0	23.4	52.3		19.9	57.8	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		237.1	1.3		146.8	8.0	23.4	52.3		19.9	57.8	
LOS		F	A		F	A	C	D		B	E	
Approach Delay		147.9			122.2			48.2			54.5	
Approach LOS		F			F			D			D	
Queue Length 50th (ft)		-56	0		-455	19	35	358		17	295	
Queue Length 95th (ft)		#148	0		#672	50	61	#521		39	#483	
Internal Link Dist (ft)		35			434			2814			146	
Turn Bay Length (ft)						50						
Base Capacity (vph)		56	266		461	836	249	625		253	567	
Starvation Cap Reductn		0	0		0	0	0	0		0	0	
Spillback Cap Reductn		0	0		0	0	0	0		0	0	
Storage Cap Reductn		0	0		0	0	0	0		0	0	
Reduced v/c Ratio		1.23	0.16		1.21	0.14	0.37	0.90		0.18	0.85	

Intersection Summary

Cycle Length: 103

Intersection Capacity Analysis

Route 140 at S. Main St., Milford

8/5/2013

Actuated Cycle Length: 99.5

Natural Cycle: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.23

Intersection Signal Delay: 81.0

Intersection LOS: F

Intersection Capacity Utilization 75.8%

ICU Level of Service D

Analysis Period (min) 15







~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 10: CVS Driveway/South Main St & Cape Rd (Route 140)

 ø1	 ø2	 ø4	 ø8
14 s	35 s	14 s	40 s
 ø5	 ø6		
14 s	35 s		





















APPENDIX D

AM/PM Peak-Hour Intersection Capacity Analysis Proposed Improvements

Intersection Capacity Analysis

Route 140 at S. Main St., Milford

8/6/2013

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	16	22	25	316	21	48	124	426	17	34	333	0
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.92	0.92	0.92	0.89	0.89	0.89
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	6%	6%	6%	3%	3%	3%	4%	4%	4%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	19	57	0	0	406	58	135	481	0	38	374	0
Turn Type	Perm	NA		Perm	NA	pm+ov	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8	1	1	6		5	2	
Permitted Phases	4			8		8	6			2	2	
Detector Phase	4	4		8	8	1	1	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	10.0		6.0	10.0	
Minimum Split (s)	10.0	10.0		11.0	11.0	10.0	10.0	15.0		10.0	15.0	
Total Split (s)	14.0	14.0		40.0	40.0	10.0	10.0	35.0		10.0	35.0	
Total Split (%)	14.1%	14.1%		40.4%	40.4%	10.1%	10.1%	35.4%		10.1%	35.4%	
Yellow Time (s)	3.0	3.0		4.0	4.0	3.0	3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0			5.0	4.0	4.0	5.0		4.0	5.0	
Lead/Lag						Lead	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?						Yes	Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None	None	None	Min		None	Min	
Act Effect Green (s)	8.3	8.3			30.9	43.1	31.4	27.3		30.6	25.1	
Actuated g/C Ratio	0.10	0.10			0.37	0.52	0.38	0.33		0.37	0.30	
v/c Ratio	0.16	0.30			0.85	0.07	0.44	0.81		0.15	0.67	
Control Delay	44.2	28.1			46.0	3.5	23.8	41.0		18.6	34.9	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	44.2	28.1			46.0	3.5	23.8	41.0		18.6	34.9	
LOS	D	C			D	A	C	D		B	C	
Approach Delay		32.1			40.7			37.3			33.4	
Approach LOS		C			D			D			C	
Queue Length 50th (ft)	11	16			230	0	51	276		14	198	
Queue Length 95th (ft)	31	49			#364	15	93	#467		33	302	
Internal Link Dist (ft)		20			492			2811			150	
Turn Bay Length (ft)						50						
Base Capacity (vph)	158	244			597	843	304	723		253	740	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.12	0.23			0.68	0.07	0.44	0.67		0.15	0.51	
Intersection Summary												
Cycle Length: 99												

Intersection Capacity Analysis

Route 140 at S. Main St., Milford

8/6/2013

Actuated Cycle Length: 83.2

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 37.0

Intersection LOS: D

Intersection Capacity Utilization 65.4%







ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.





















Splits and Phases: 10: CVS Driveway/South Main Street & Cape Road (Route 140)

 ø1	 ø2	 ø4	 ø8
10 s	35 s	14 s	40 s
 ø5	 ø6		
10 s	35 s		

Intersection Capacity Analysis

Route 140 at S. Main St., Milford

8/6/2013

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	32	33	39	457	47	109	77	448	19	43	447	0
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.93	0.93	0.93	0.90	0.90	0.90	0.83	0.83	0.83	0.93	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	2%	2%	2%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	34	77	0	0	560	121	93	563	0	46	481	0
Turn Type	Perm	NA		Perm	NA	pm+ov	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8	1	1	6		5	2	
Permitted Phases	4			8		8	6			2	2	
Detector Phase	4	4		8	8	1	1	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	10.0		6.0	10.0	
Minimum Split (s)	10.0	10.0		11.0	11.0	10.0	10.0	15.0		10.0	15.0	
Total Split (s)	14.0	14.0		45.0	45.0	10.0	10.0	35.0		10.0	35.0	
Total Split (%)	13.5%	13.5%		43.3%	43.3%	9.6%	9.6%	33.7%		9.6%	33.7%	
Yellow Time (s)	3.0	3.0		4.0	4.0	3.0	3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0			5.0	4.0	4.0	5.0		4.0	5.0	
Lead/Lag						Lead	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?						Yes	Yes				Yes	
Recall Mode	None	None		None	None	None	None	Min		None	Min	
Act Effect Green (s)	8.7	8.7			40.4	51.5	36.6	32.2		34.9	27.8	
Actuated g/C Ratio	0.09	0.09			0.41	0.52	0.37	0.33		0.35	0.28	
v/c Ratio	0.37	0.41			1.05	0.14	0.51	0.93		0.25	0.91	
Control Delay	56.2	30.6			85.5	8.0	30.7	58.4		23.1	57.8	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	56.2	30.6			85.5	8.0	30.7	58.4		23.1	57.8	
LOS	E	C			F	A	C	E		C	E	
Approach Delay		38.4			71.7			54.5			54.7	
Approach LOS		D			E			D			D	
Queue Length 50th (ft)	22	22			~431	20	39	~410		19	305	
Queue Length 95th (ft)	54	68			#639	51	67	#545		42	#490	
Internal Link Dist (ft)		35			434			2814			146	
Turn Bay Length (ft)						50						
Base Capacity (vph)	106	214			532	865	182	605		184	577	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.32	0.36			1.05	0.14	0.51	0.93		0.25	0.83	

Intersection Summary

Cycle Length: 104

Intersection Capacity Analysis

Route 140 at S. Main St., Milford

8/6/2013

Actuated Cycle Length: 98.7

Natural Cycle: 110

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.05

Intersection Signal Delay: 59.6

Intersection LOS: E

Intersection Capacity Utilization 75.8%

ICU Level of Service D

Analysis Period (min) 15







~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 10: CVS Driveway/South Main St & Cape Rd (Route 140)

 ø1	 ø2	 ø4	 ø8
10 s	35 s	14 s	45 s
 ø5	 ø6		
10 s	35 s		